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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 4 : B62B 1/24, B62D 51/04 // F02B 67/06, 65/00, 63/00 F02B 77/14

A1

(11) International Publication Number: WO 89/ 01892

(43) International Publication Date: 9 March 1989 (09.03.89)

(21) International Application Number: PCT/AU88/00326

(22) International Filing Date: 25 August 1988 (25.08.88)

(31) Priority Application Numbers: PI 3953
PI 7679

(32) Priority Dates: 25 August 1987 (25.08.87)
11 April 1988 (11.04.88)

(33) Priority Country: AU

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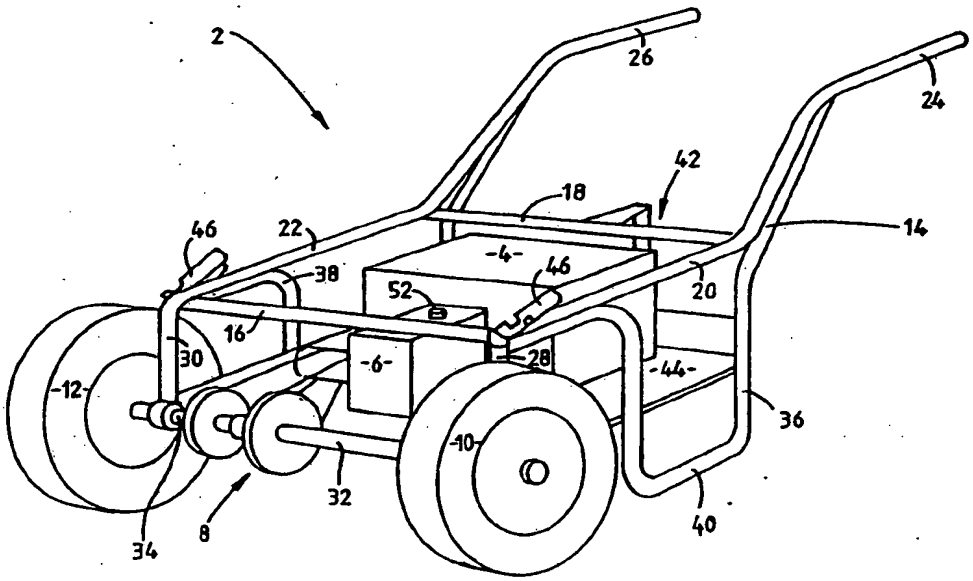
(81) Designated States: AT (European patent), AU, BE (European patent), BJ (OAPI patent), CF (OAPI patent), CG (OAPI patent), CH (European patent), CM (OAPI patent), DE (European patent), FR (European patent), GA (OAPI patent), GB (European patent), IT (European patent), JP, LU (European patent), ML (OAPI patent), MR (OAPI patent), NL (European patent), SE (European patent), SN (OAPI patent), TD (OAPI patent), TG (OAPI patent), US.

Published
With international search report.

(54) Title: A PORTABLE DRIVE UNIT



(57) Abstract

A portable drive unit (2) for driving a variety of apparatuses comprises a support structure (14) equipped with a pair of axially aligned traction wheels (10, 12). An engine (4) and a power transmission unit (6) are mounted on the support structure (14). An output shaft from the transmission unit (6) drives the traction wheels (10, 12) via a belt drive system (8). An additional output shaft (52) of the transmission unit (6) is adapted to drive the subject apparatus, optionally via a cable drive system. The subject apparatus is wholly or partly supported by the support structure depending on its functional nature and may comprise a wheelbarrow tray, a generator and jackhammer, a post hole digger, a fork-lift, a vacuum unit, a cutting blade, a slashing apparatus, a chain saw and the like.

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"A PORTABLE DRIVE UNIT"

The present invention relates to a portable drive unit for supporting, transporting and driving a variety of apparatuses such as a wheelbarrow tray, a generator and jackhammer, a cement mixer, an air compressor, a post hole digger and the like.

In accordance with the present invention there is provided a portable drive unit comprising:

an engine having a drive shaft;

a pair of drive wheels axially aligned with respect to one another;

means coupled to said drive shaft, for driving said wheels and for driving an additional shaft which may be used to drive a variety of apparatuses; and

a support structure to which said wheels are coupled, for supporting said engine, at least part of

said driving means and one of said apparatuses when placed onto said structure and attached thereto such that said one of said apparatuses may thereby be driven by said additional shaft.

Preferred embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings wherein:

Figure 1 is schematic perspective view of a portable drive unit according to a first embodiment of the present invention;

Figure 2 is a partial plan view of the drive unit of Figure 1;

Figure 3 is a partial underneath view of the drive unit of Figure 1 showing a chain drive employed in the unit;

Figure 4 is a partial side view of the drive unit illustrating a belt drive system of the unit;

Figure 5 is a partial plan view of a drive unit according to a second preferred embodiment of the present invention;

Figure 6 is a partial cross-sectional view illustrating connection of a flexible cable and an auxiliary shaft of the drive unit;

Figure 7 is a side view of an engaging mechanism;

Figure 8 is a side view of a drive unit with a wheelbarrow tray attached thereto;

Figure 9 is a plan view of a device used in tipping the tray of Figure 8;

Figure 10 is a partial plan view of a drive unit according to a third preferred embodiment of the present invention;

Figure 11 is a side view of collapsible handles of the drive unit;

Figure 12 is a perspective view of a drive unit with a forklift apparatus attached thereto;

Figure 13 is a perspective view of a drive unit with a vacuum apparatus attached thereto;

Figure 14 is a perspective view of a drive unit with a cutting blade apparatus attached thereto;

Figure 15 is a perspective view of a drive unit with a slashing apparatus attached thereto; and

Figure 16 is a perspective view of a drive unit with a chain-saw apparatus attached thereto.

A portable drive unit 2, as shown in Figures 1 to 4, includes an engine 4, a gear box 6 coupled to the engine 4, a belt drive system 8, a pair of drive wheels 10 and 12 and a support frame 14. The support frame 14 is constructed primarily from steel tubing and includes front and rear horizontal tubes 16 and 18, respectively, which are fixed at each end to side tubes 20 and 22, which are disposed on respective sides of the drive unit 2. Towards the rear of the drive unit 2 the side tubes 20 and 22 extend upwardly so as to form two handles 24 and 26 and towards the front of the drive unit 2 the side tubes 20 and 22 extend downwardly so as to form horizontal portions 28 and 30 to which axial shafts 32 and 34 of the wheels 10 and 12 are rotatably coupled, respectively. The support frame 14 also includes two substantially U-shaped tubes 36 and 38 disposed on opposite sides of the drive unit 2 wherein the ends of the tubes 36 and 38 are affixed to the side tubes 20 and 22, respectively. The bottom portions 40 of the U-shaped tubes 36 and 38 may be used to engage

the ground and support the rear of the drive unit 2 however normally a castor 42 (as fully illustrated in Figure 8) is provided at the rear of the drive unit 2 for this purpose. The castor 42 is normally removably attached to the rear tube 18. The support frame 14 also includes a base plate 44 attached to the side U-shaped tubes 36 and 38 and which is used to support the engine 4 and the gear box 6. It should be noted that Figure 1 is only a schematic diagram illustrating only some of the parts of the drive unit 2.

The wheels 10 and 12 are driven independently by the belt drive system 8 in response to actuation of tension rollers on the belts of the system 8 by a user of the unit, as will be described in more detail hereinafter. Thus a user is able to manouevre the drive unit 12 by driving the wheels 10 and 12 in a desired manner. A variety of apparatuses may be placed on the support frame 14 for support thereby and may be attached to the drive unit 2 by engaging mechanisms 46 (to be described in detail hereinafter). The apparatuses may include a wheelbarrow tray, as shown in Figure 8, a generator and jack hammer, a cement mixer, an air compressor, a hosing unit, a post hole digger or any one of the apparatuses 50 illustrated in Figures 10 to 14. Each of the apparatuses attached to the drive unit 2 is driven by a flexible cable which in turn is driven by an additional drive shaft 52 which protrudes from the gear box 6 and is continuously driven whenever the engine 4 is running, the flexible cable may engaged and disengaged with the additional shaft 52 as desired by a user and described in detail hereinafter

with reference to Figure 6.

The engine 4 is preferably a four hp 11.39 cubic 4 stroke engine, such as model no. 114702 produced by Briggs and Stratton, which produces 6.12 cubic lbs at 2600 rpm. The drive shaft 54 of the engine 4 is coupled to the additional shaft 52 of the gear box 6 by a chain drive 56 disposed underneath the base plate 44 and which is used to produce a speed reduction of 2.3:1. A tension cog 58 is provided which normally engages the chain 60 of the drive 56 and is adjustable in position so that the tension of the chain 60 may be adjusted as desired. The additional shaft 52 is a 19 mm shaft which is supported in the gear box 6 by two heavy duty bearings (not shown) and protrudes from the top of the gear box 6, as shown in Figure 1. A heat treated steel worm gear 60 is attached to the additional shaft 52 and drives a worm cog 62 which is affixed to a belt drive shaft 64, which extends from the gear box 6, as shown in Figure 2. The worm gear 60 and cog 62 are configured so as to provide a gear ratio of 27:1. The belt drive shaft 64 in turn drives two wheels 66 and 68 which are attached thereto. The wheels 66 and 68 are coupled to wheels 70 and 72, respectively, by two respective A size V-belts 74 and 76.

Whenever the engine 4 is running so as to drive its drive shaft 54 the wheels 66 and 68 are continuously driven. However the wheels 70 and 72 are only driven by the belts 74 and 76 when respective tension rollers 78 and 80 are used to engage the belts 74 and 76, as shown in Figure 4, so

as to tension the belts 74 and 76 and cause them to grip the respective wheels 66, 68, 70 and 72 coupled thereto. The tension rollers 78 and 80 are movable by means of levers 82 and 84 which are centrally pivotally coupled to a strut 86, which is positioned above the belts 74 and 76. The rollers 78 and 80 are disposed at a lower end of each lever 82 and 84. The other end of each lever 82 and 84 may be moved as required by a user either manually or by means of a cable 88 affixed to the end and coupled to an actuating mechanism affixed to a respective handle 26 or 24. The wheels 70 and 72 are attached to the axial shafts 32 and 34, respectively, of the drive wheels 10 and 12. At the end of the axial shaft 32 of the drive wheel 10 there is disposed a cylinder 90 which is adapted to receive the axial shaft 34 of the drive wheel 12. The drive wheels 10 and 12 are axially aligned and effectively coupled to one another but are able to rotate independently with respect to one another and, in particular, a user may cause a tension roller 78 to engage the belt 74 thereby driving the drive wheel 10 whilst the drive wheel 12 is not so driven and is free to rotate. Thus the belt drive system 8 enables a user to drive the drive wheels 10 and 12 equally so as to move the drive unit 2 forward whilst the user may also cause one wheel 10 or 12 to be driven faster than the other wheel 12 or 10 thereby turning the drive unit 2 in a desired direction.

In order to provide extra drive so that heavier loads may be transported by the drive unit 2, the chain drive 56 and the gear box 6 may be replaced by a hydrostatic unit 100, as shown in Figure 5. The

unit 100 comprises 5 ball pressure hydraulic pump connected by a series of chambers to a ball motor. Preferably the unit 100 is a hydraulic pump motor of the type produced by Eaton, model 6-7 or 11. The engine 4 is placed on its side so that the drive shaft 54 of the engine 4 is directly coupled to the hydrostatic unit 100 to drive the motor 100. The additional shaft 52, disposed horizontally, is coupled to the drive shaft 54 by a belt 102 and wheels 104 and 106, affixed to the drive shaft 54 and the additional shaft 52, respectively. The output shaft of the hydrostatic motor 100 is used as the belt drive shaft 64 and the wheels 66 and 68 of the belt drive system are attached thereto. The drive applied by the hydrostatic unit 100 to the wheels 10, 12 is controlled by a hand control which is attached to one of the handles 24, 26 and is coupled to the unit 100 by a cable. The hydrostatic unit 100 acts as a gearbox and may be placed in forward, reverse or neutral.

The additional shaft 52 has a slot 110 disposed at one end thereof so as to receive a complementary end 112 of a flexible drive cable 114, as shown in Figure 6. Affixed to the outer protective sheath 116 of the cable 114 is a male engagement cap 118 which is adapted to engage the upper end of a tube 120 in which the additional shaft 52 is disposed. Although not illustrated in Figure 6, the cap 118 and the upper end of the tube 120 are configured so as to facilitate simple rigid engagement of the cap 118 with the tube 120 and simple removal of the cap 118 from the tube 120,

thereby enabling a user to relatively simply connect the flexible cable 114 to the additional shaft 52 as desired. On engagement of the flexible drive cable 114 with the additional shaft 52, as shown in Figure 6, the additional shaft 52 drives the cable 114 which in turn drives one of the apparatuses described previously.

An engagement mechanism 46, as shown in Figure 7, is placed at a number of points of the support frame 14 so as to enable the apparatuses described previously to be attached to the drive unit 2. The engagement mechanism 46 comprises a base part 132 which is affixed to the support frame 14 and has an upper portion 134 formed in the shape of a hook so that the base part includes a recess 136 into which tubing 138 of the apparatuses may be inserted. The engagement mechanism 46 also includes a catch part 140 which is bifurcated at one end thereof so as to have two arms 142 and 144 which have a rounded recess 146 disposed therebetween. One arm 144 is pivotably attached to the hook portion 134 of the base part 132 so that once a portion of tubing 138 is inserted in to the recess 136 of the base part 132 the catch part 140 may be pivoted with respect to the base 132 so that the arms 142 and 144 hold the portion of tubing 138 within the engagement mechanism 46.

In order to perform wheelbarrow tasks with the drive unit 2 a wheelbarrow tray apparatus 150 may be affixed to the drive unit 2, as shown in Figure 8. The wheelbarrow apparatus 150 includes a wheelbarrow tray 152, a tube 154 disposed at the bottom front of the tray 152, two struts 156 disposed on either side of the tray 152 and pivotably coupled

at one end to the bottom rear of the tray 152, and two guide tracks 158 affixed to opposite sides of the drive unit 2 and which receive the other ends of the struts 156. The other ends of the struts 156 each include a rotatable wheel 160 attached thereto which is adapted to run along the oblong tracks 158, as shown in Figure 9. Each wheel 160 is coupled to a relatively small gear box 162 which in turn is coupled to the flexible drive cable 114. The flexible drive cable 114, when connected to the additional shaft 52 drives the wheels 160 so that they traverse the guide tracks 158 thereby causing the upper ends of the struts 156 to move upwardly and downwardly so as to periodically tilt or tip the tray 152. When the wheels 160 are positioned at the forward end 164 of the tracks 158, the tray 152 is in a lowered position as shown in Figure 8, whereas when the wheels 160 are positioned at the rear end 166 of the tracks 158, the struts 156 are positioned so that the tray 152 is fully tilted so as to cause any contents of the tray 152 to be removed therefrom.

A further embodiment of the portable drive unit 2, as shown in Figure 10, includes a differential 200 instead of the belt system 8 illustrated in Figure 2. The differential 200 is driven by a chain belt 202 which, in turn, is driven by the output shaft 64 of the hydrostatic unit 100. The differential 200 imparts drive to the axles 32 and 34 of the wheels 10 and 12, respectively, and is configured so that if a larger portion of the weight of the drive unit 2 is placed on the left wheel 10 then the right wheel 12 rotates faster than left wheel 10, thereby causing the unit 2 to veer left. Similarly, if a larger portion of the weight of the

drive unit 2 is placed on the right wheel 12, the drive unit 2 is caused to veer right. This embodiment removes the requirement for the independent levers 82 and 84 to enable steering of the drive unit 2. The hydrostatic unit 100 is placed in front of the engine 4 and is driven by the additional shaft 52. The additional shaft 52 is, in turn, driven by an A size V-section belt 204 which is coupled to the drive shaft 54 of the engine 4. The ratio at which drive is transmitted to the additional shaft 52 from the engine 4 depends of the size of the pulley wheels attached to the drive shaft 54 and additional shaft 52, respectively, and about which the belt 204 is disposed. The additional shaft 52 in this embodiment is used to drive apparatuses 50, such as generators and cement mixers, attached to the drive unit 2 by means of a pulley arrangement 206, whereby whenever the engine 4 is running to drive the drive shaft 54, the apparatus 50 attached to the unit 2 is driven by the pulley arrangement 206.

The handles 24 and 26 may also be configured, as shown in Figure 11, so that they are collapsible by moving the handles in the direction of the arrow 210 onto the support frame 14 of the unit 2. This is achieved by connecting the handles 24 and 26 to the remainder of the support frame 14 by means of respective hinges 212, which can be locked in a closed position, as shown in Figure 11, by means of respective locking bolts 214. Prior to transport of the drive unit 2, the locking bolts 214 are removed and the handles 24 and 26 are pivoted about the axes 216 of their respective hinges 212, in the direction of the arrow 210, so as to be placed in a collapsed position on the support frame 14.

CLAIMS

1. A portable drive unit (2) comprising:

an engine (4) having a drive shaft (54);

a pair of drive wheels (10, 12) axially aligned with respect to one another;

means (6, 8, 100, 102, 200, 204) coupled to said drive shaft (54), for driving said wheels (10, 12) and for driving an additional shaft (52) which may be used to drive a variety of apparatuses (50); and

a support structure (14, 44) to which said wheels (10, 12) are coupled, for supporting said engine (4), at least part of said driving means (6, 8, 100, 102, 200, 204) and one of said apparatuses (50) when placed onto said structure and attached thereto (14, 44) such that said one of said apparatuses (50) may thereby be driven by said additional shaft (52).

2. A portable drive unit (2) as claimed in claim 1, wherein said wheels (10, 12) are disposed at one end of said unit (2) and the opposite end of said unit (2) includes means (40, 42) for supporting, together with said wheels (10, 12), the weight of said unit (2).

3. A portable drive unit (2) as claimed in claim 2, further comprising handles means (24, 26) which extends from said opposite end.

4. A portable drive unit (2) as claimed in claim 3, wherein said support structure comprises a base plate (44) and a frame (14) configured about

said plate (44), such that said engine (4) and said at least part of said driving means (6, 8, 100, 102, 200, 204) are disposed on said plate (44) and said one of said apparatuses (50) sits on said frame (14) when attached to said support structure (14, 44).

5. A portable drive unit (2) as claimed in claim 4, wherein said handle means (24, 26) is collapsible into said support structure (14, 44).

6. A portable drive unit (2) as claimed in claim 4 or 5, wherein said support structure (14, 44) includes means (46) for removably attaching one of said apparatuses (50) thereto.

7. A portable drive unit (2) as claimed in claim 6, wherein said driving means (6, 8, 100, 102, 200, 204) includes a gearbox (6) which is driven by said drive shaft (54) and has an output shaft (64) adapted to drive a belt system (8) which, in turn, selectively drives said wheels (10, 12) independently with respect to one another.

8. A portable drive unit (2) as claimed in claim 7, wherein said gearbox (6) includes said additional shaft (52) which protrudes therefrom, receives drive from said drive shaft (54) and transmits drive to said output shaft (64).

9. A portable drive unit (2) as claimed in claim 6, wherein said driving means (6, 8, 100, 102, 200, 204) includes a hydraulic motor (100) which is driven by said drive shaft (54) and has an output shaft (64) adapted to drive a belt system (8) which,

in turn, selectively drives said wheels (10, 12) independently with respect to one another.

10. A portable drive unit (2) as claimed in claim 6, wherein said driving means (6, 8, 100, 102, 200, 204) includes a hydraulic motor (100) which is driven by said drive shaft (54) and has an output shaft (64) adapted to drive a differential (200) which, in turn, drives said wheels (10, 12).

11. A portable drive unit (2) as claimed in claim 9 or 10, wherein said additional shaft (52) is driven by said output shaft (64) via a belt (102).

12. A portable drive unit (2) as claimed in claim 9 or 10, wherein said additional shaft (52) is driven by said drive shaft (54) via a belt (204).

13. A portable drive unit (2) as claimed in any one of the preceding claims, wherein said apparatus (50) are driven by means of a flexible cable (114) which is connectable to said additional shaft (52).

14. A portable drive unit (2) as claimed in any one of the preceding claims, wherein said apparatuses (50) are driven by means of a pulley arrangement (206) which is connected to said additional shaft (52).

15. A portable drive unit (2) as claimed in claim 13 or 14, wherein said apparatuses (50) include a wheelbarrow tray, a generator and jackhammer, a cement mixer, an air compressor, a port hole digger, a forklift, a vacuum, a cutting blade, a slashing

apparatus, a chain-saw and the like.

16. A portable drive unit (2) as claimed in claim 13, wherein said one of said apparatuses (50) comprises a wheelbarrow tray (152) and tipping means (156, 158, 169, 162) adapted to be driven by said flexible cable (114) to move said tray (152) with respect to said support structure (14, 44) such that a load supported by said tray (152) is substantially removed therefrom.

17. A wheelbarrow (2) comprising a support structure (14, 44), a front wheel (10, 12) and load support means (152) coupled to the support structure (14, 44), and drive means (6, 8, 100, 102, 200, 204, 156, 158, 169, 162) adapted to drive the front wheel (10, 12) and adapted to cause said load support means (152) to move with respect to said support structure (152) so as to substantially remove a load supported by said load structure means (152) from the wheelbarrow (2).

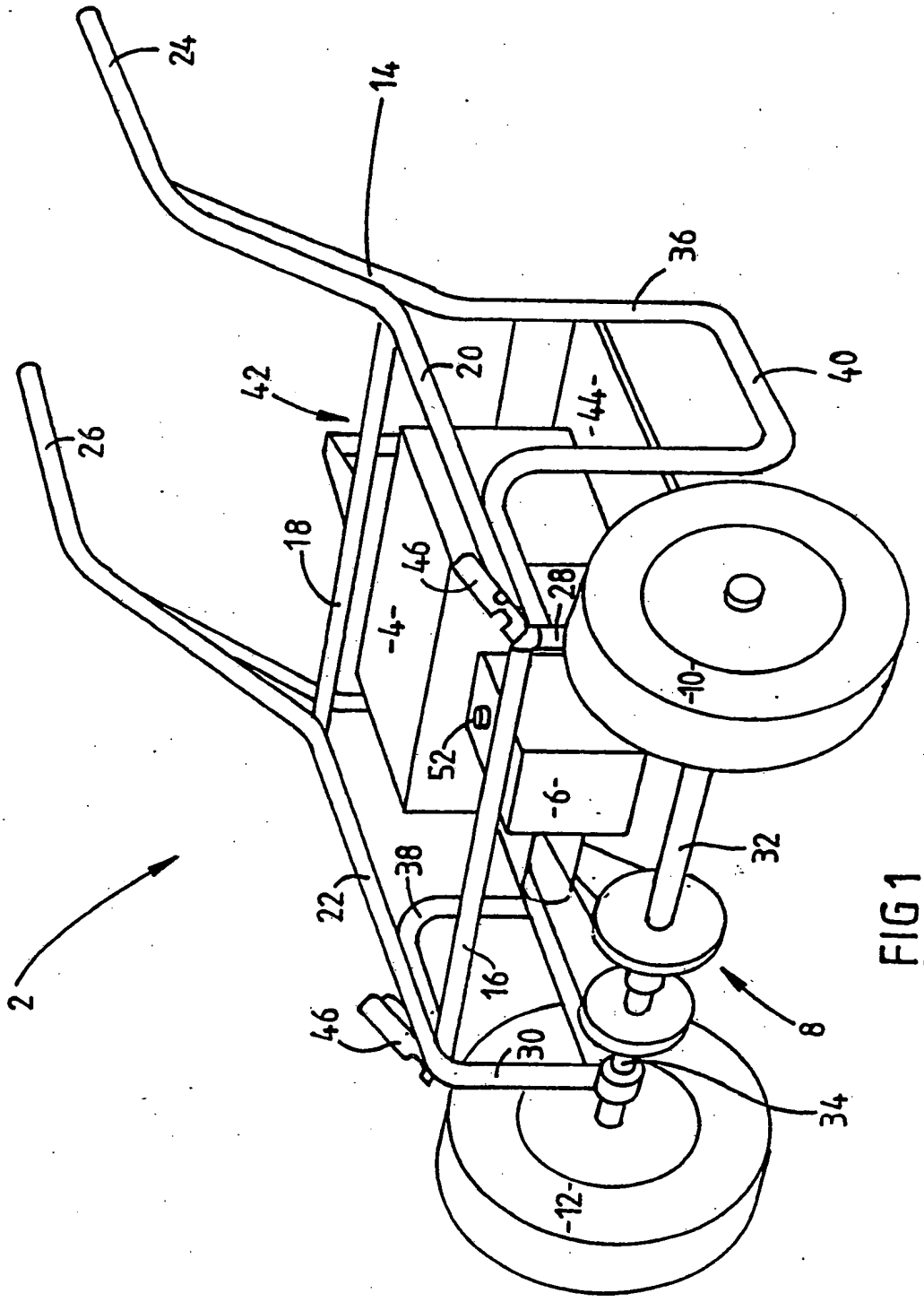
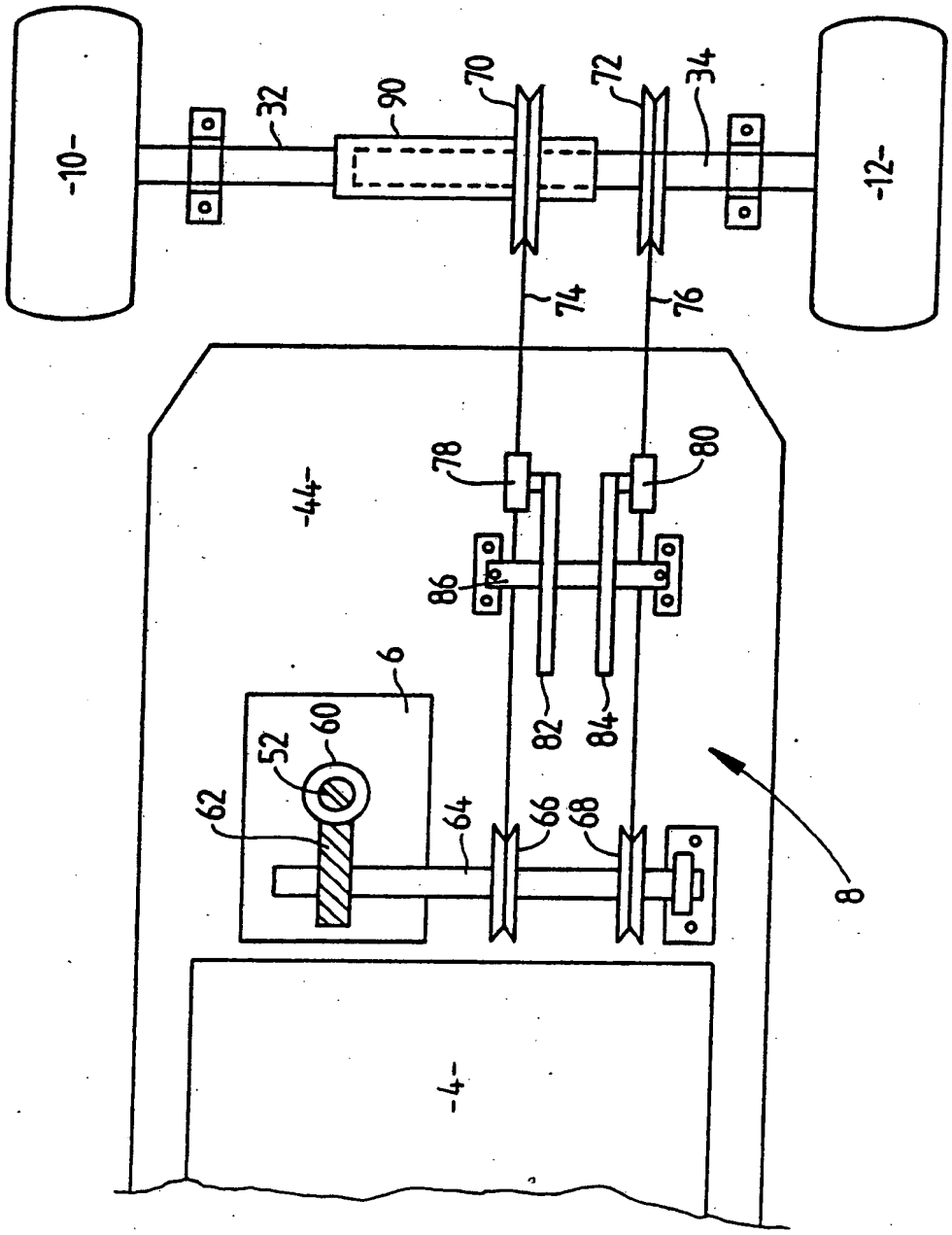


FIG 1

FIG 2



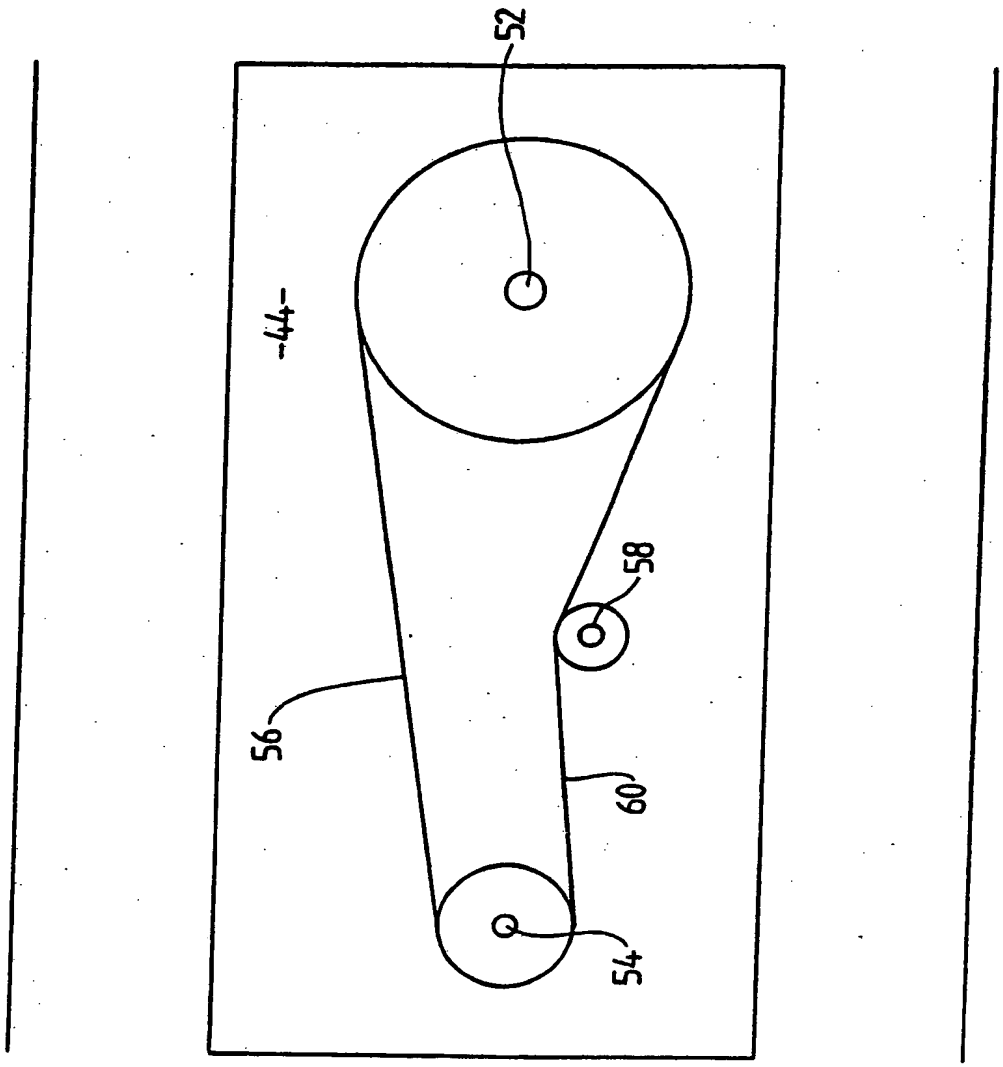


FIG 3

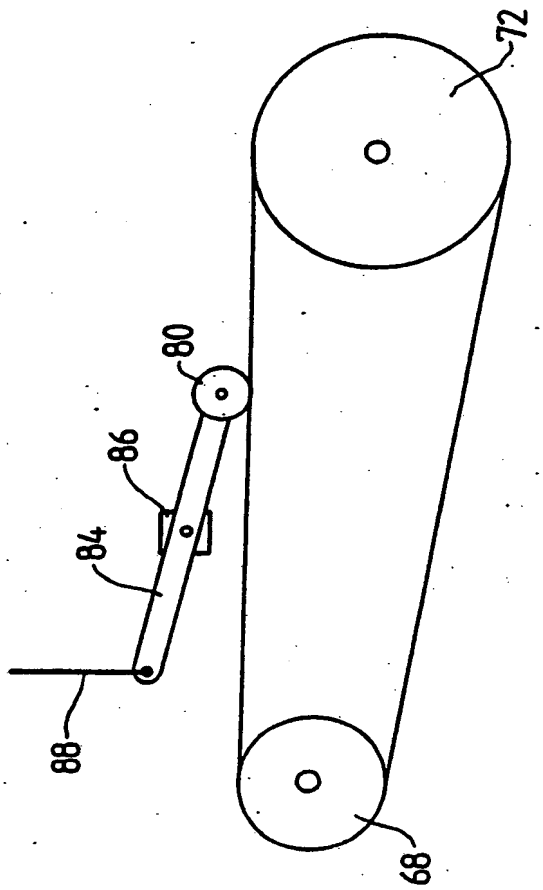


FIG 4

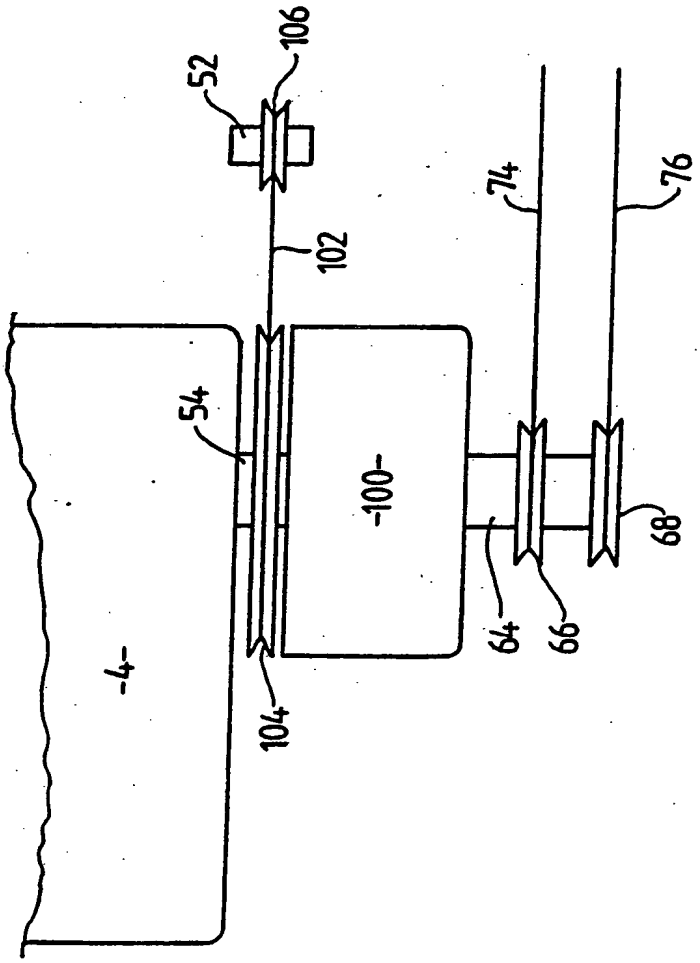


FIG 5

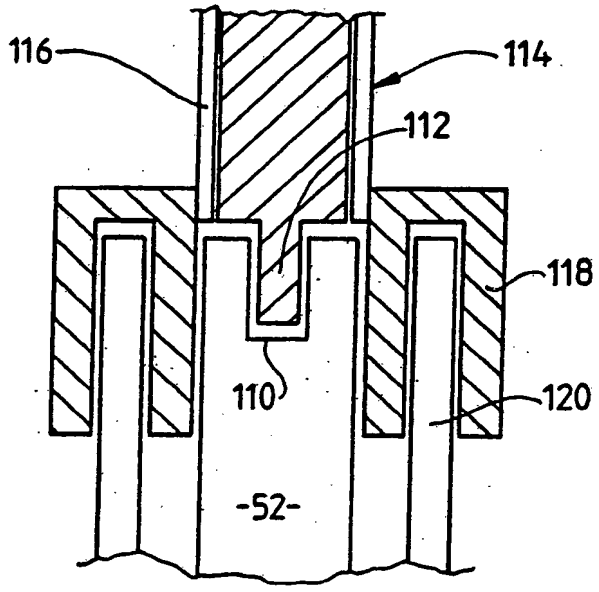


FIG 6

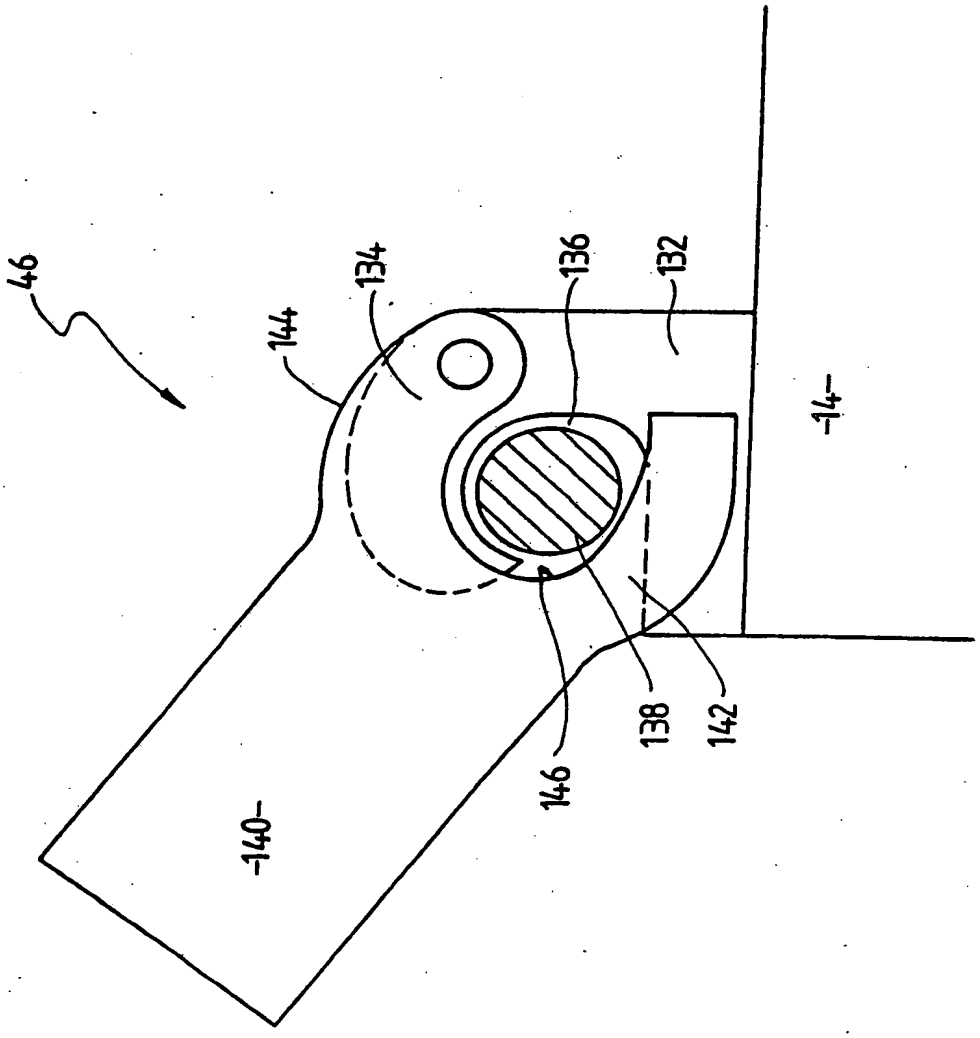


FIG 7

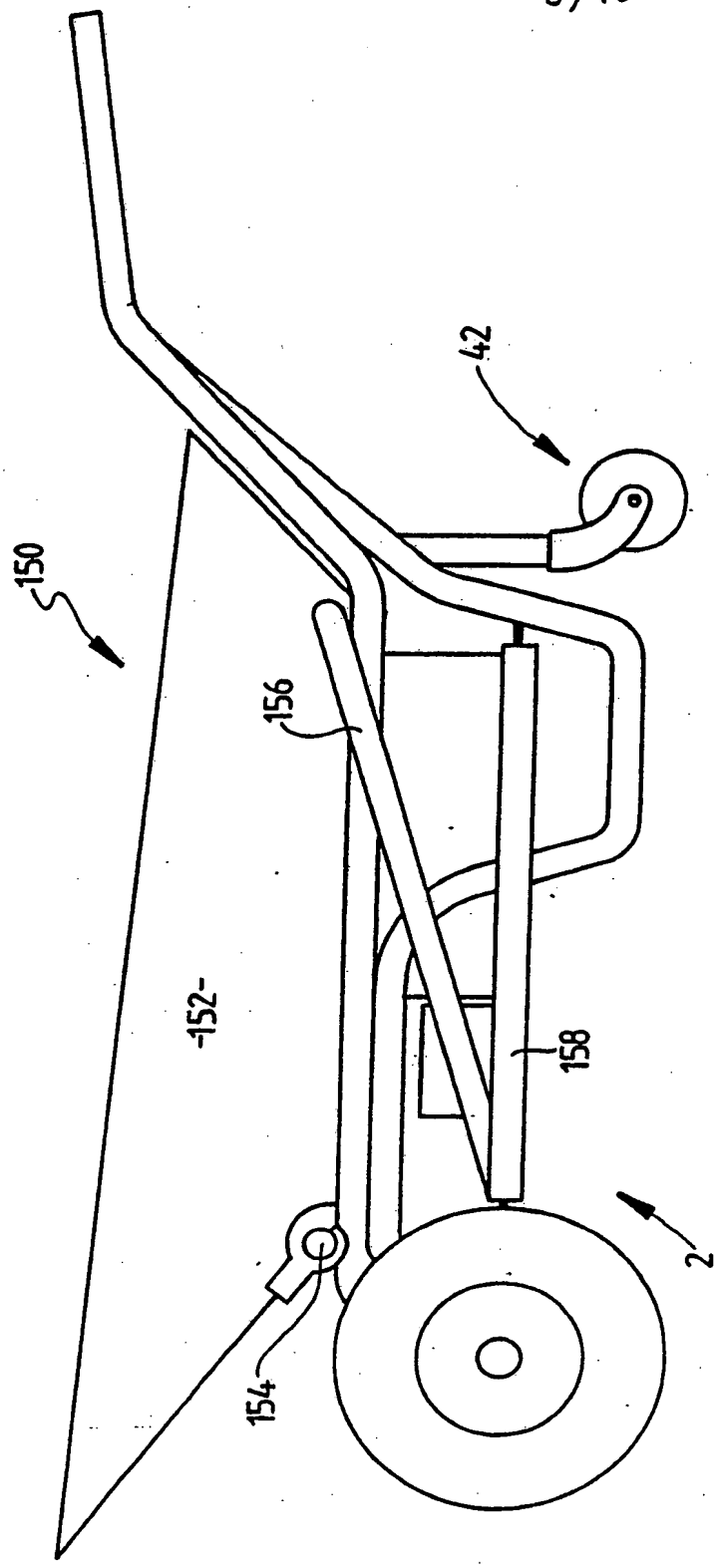


FIG 8

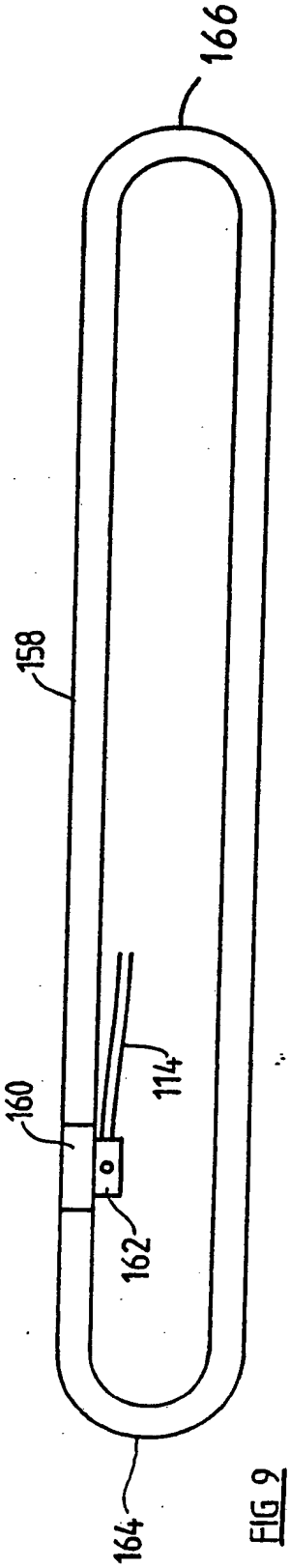


FIG 9

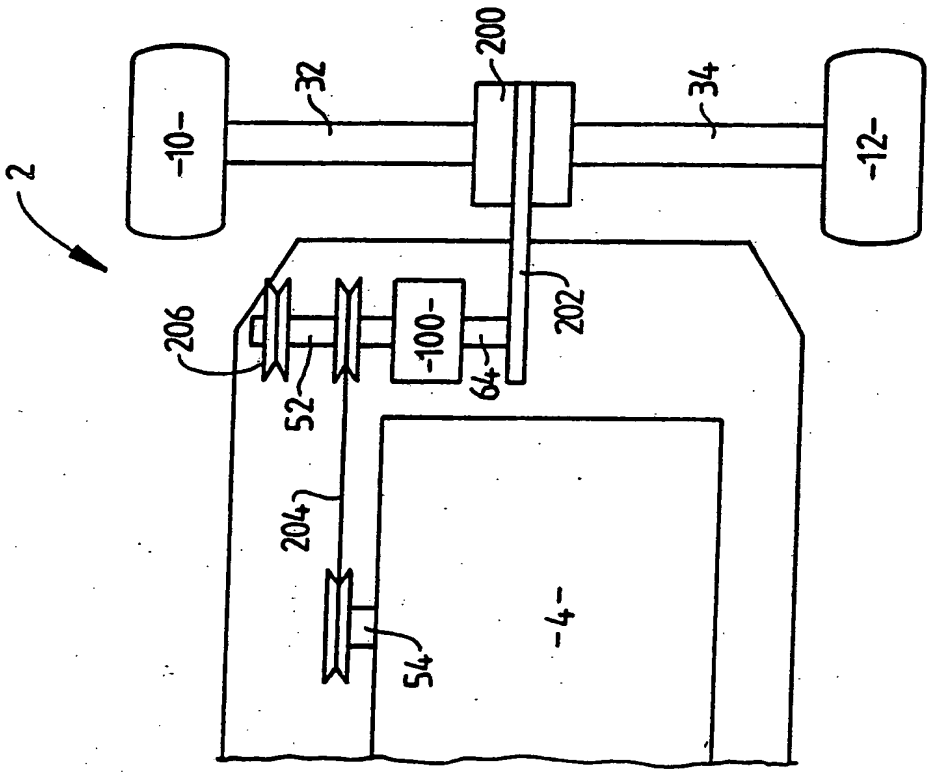


FIG 10

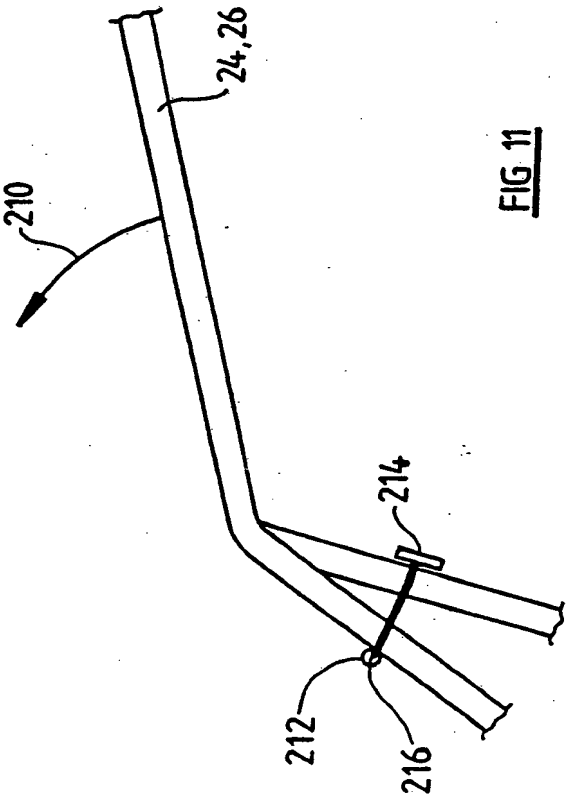


FIG 11

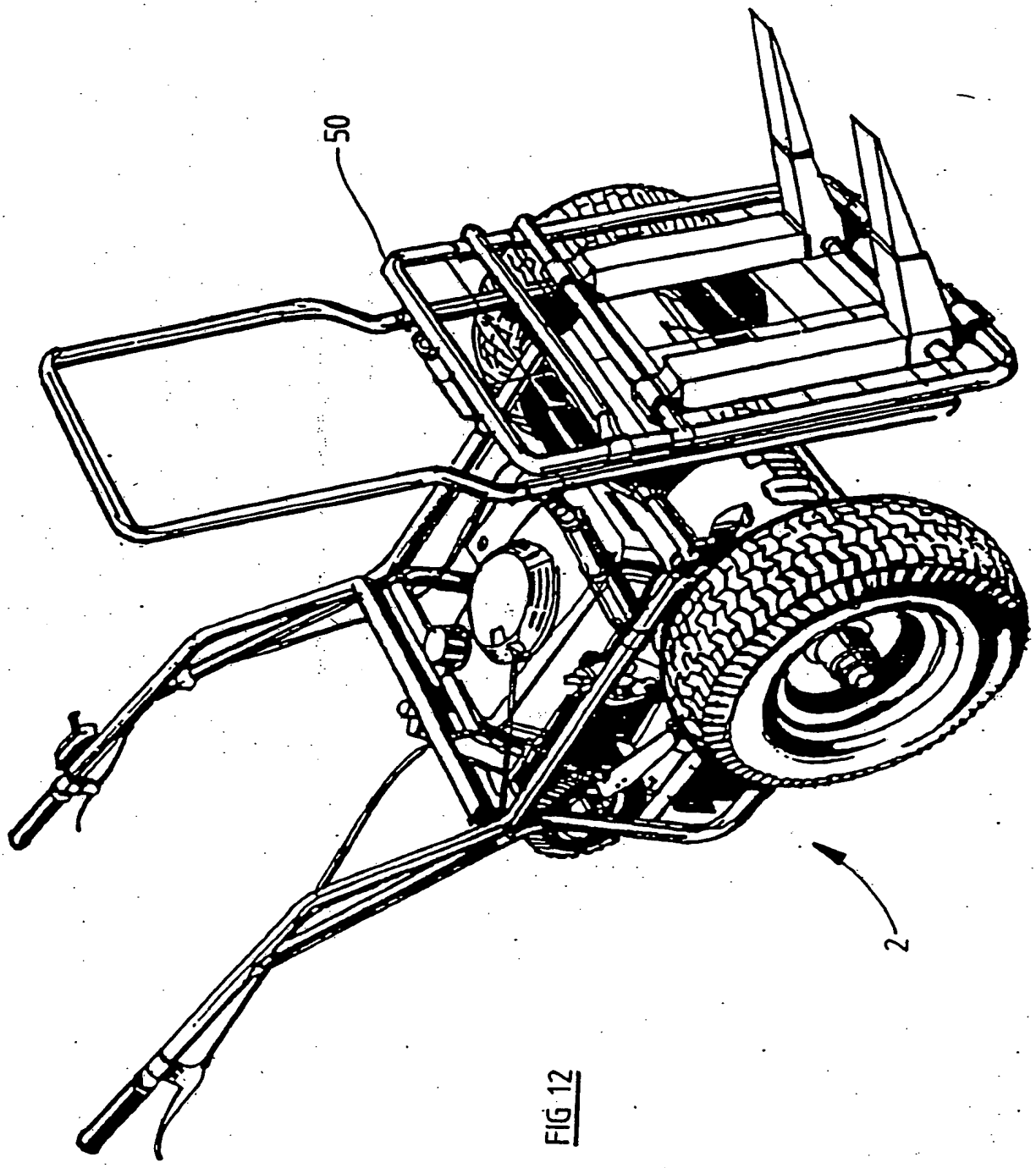


FIG 12

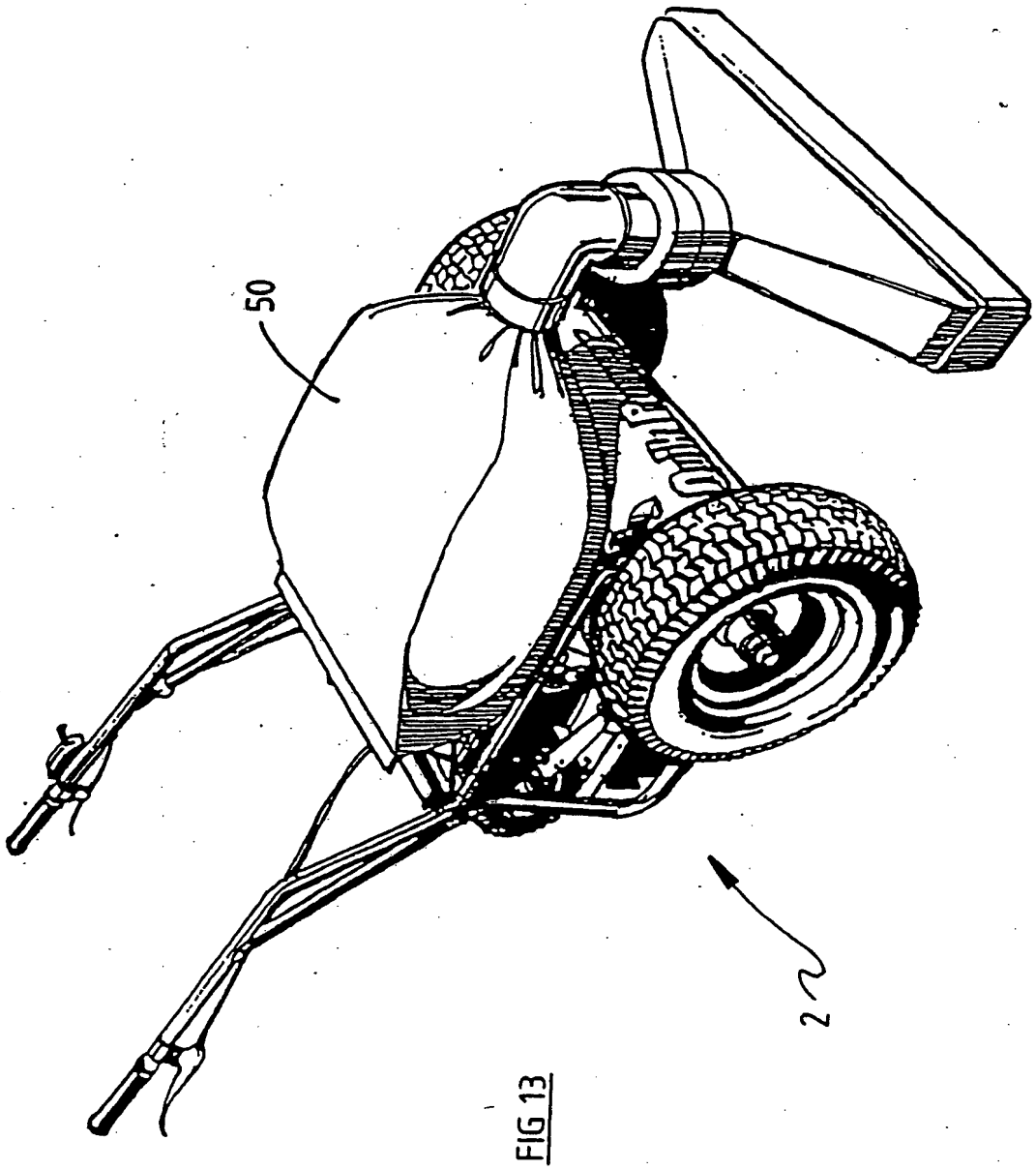


FIG 13

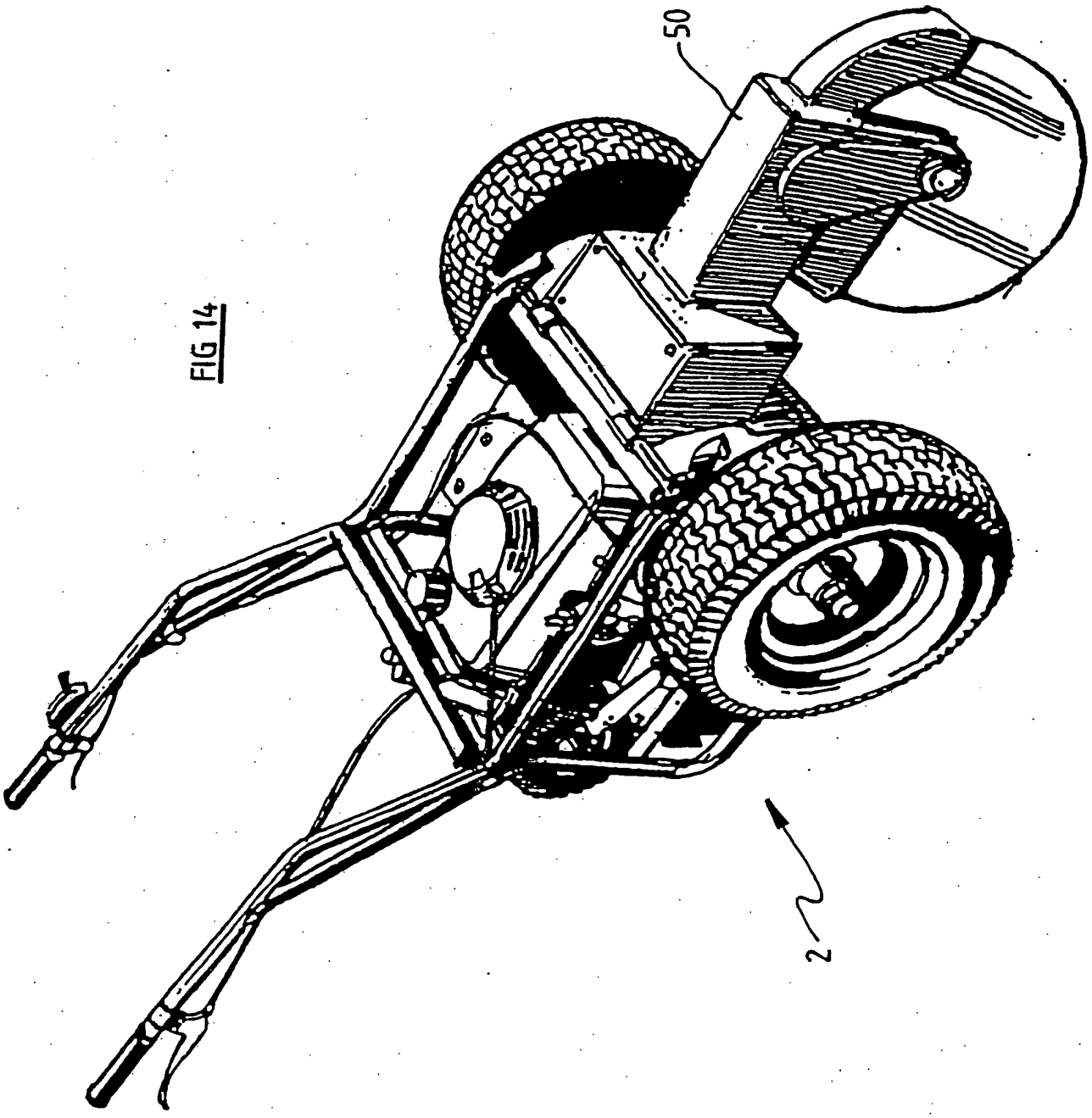


FIG 14

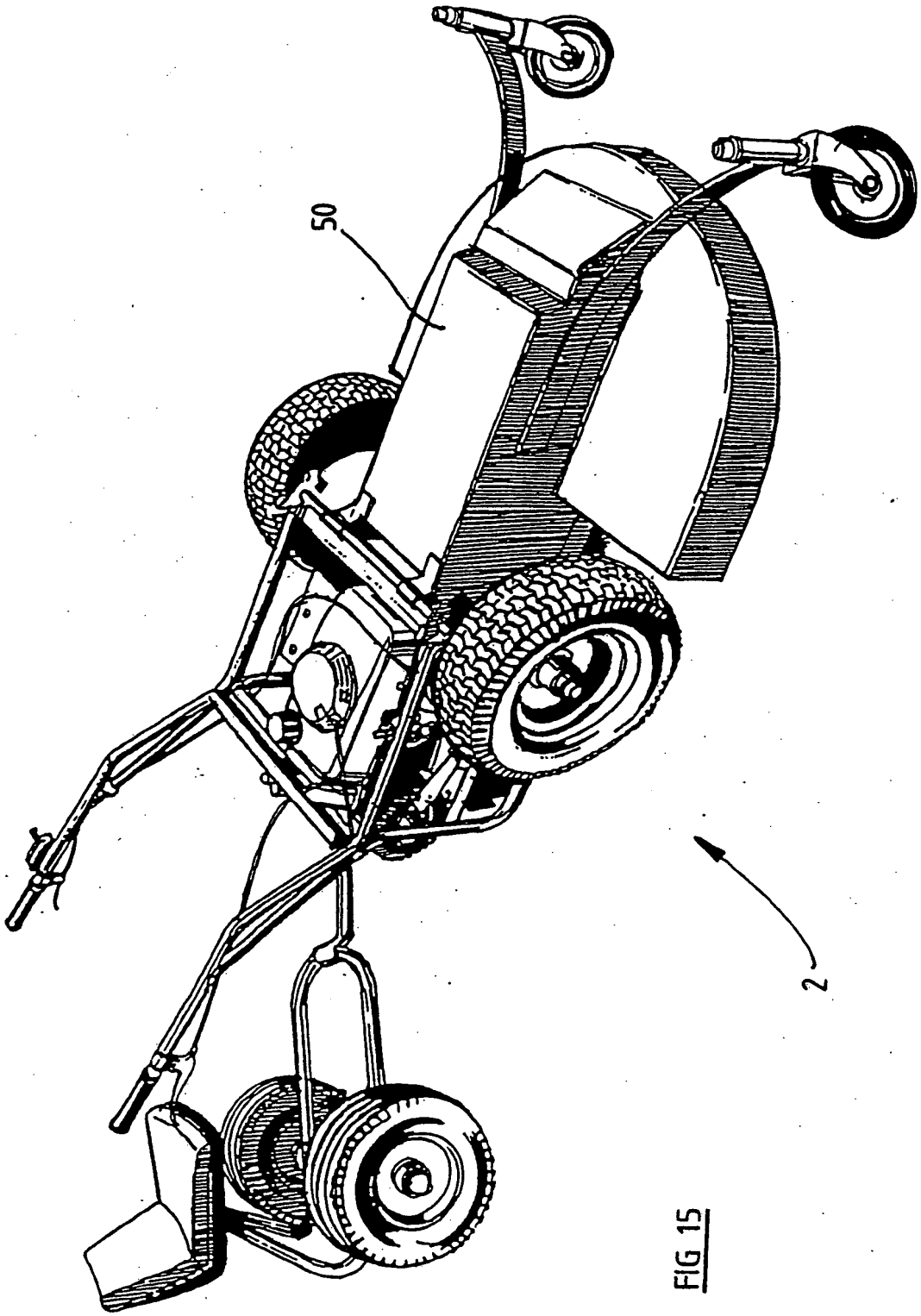
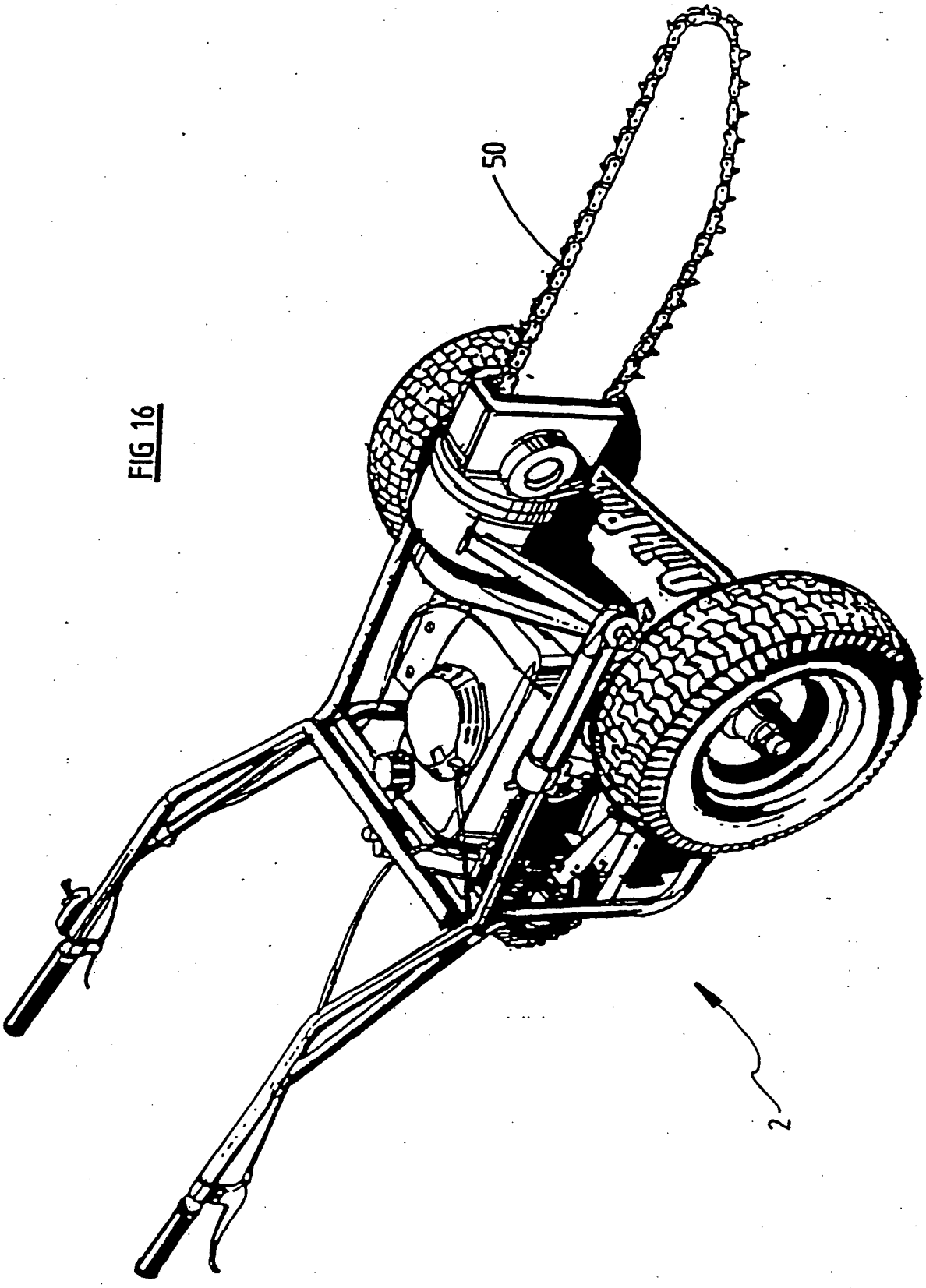


FIG 15

FIG 16



INTERNATIONAL SEARCH REPORT

International Application No PCT/AU 88/00326

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[4] B62B 1/24, B62D 51/04 // F02B 67/06, 65/00, 63/00, 77/14

II. FIELDS SEARCHED

Minimum Documentation Searched †

Classification System	Classification Symbols
IPC	B62B 1/24, B62D 51/04 // F02B 67/06, 65/00, 63/00, 77/14

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched ‡

AU : IPC as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT *

Category *	Citation of Document, ** with indication, where appropriate, of the relevant passages ††	Relevant to Claim No. ‡‡
X	GB,A, 544065 (BOYDELL) 26 March 1942 (26.03.42)	(1-15)
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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
12 De-ember 1988 (12.12.88)	15 DECEMBER 1988 (15 12 88)
International Searching Authority	**Signature of Authorized Officer**
Australian Patent Office	C.M. WYATT

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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 88/00326

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Members
US 4117652	CA 1068944

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